

**What is claimed is:**

1. A method for detecting a network isolation by a network node, comprising:  
receiving a beacon packet from a parent node over a network;  
storing an aging indicator for the beacon packet after an aging interval; and  
indicating a network isolation condition if the beacon packet with the aging indicator is not replaced with a second beacon packet after a second interval greater than the aging interval.
2. The method of claim 1, the beacon packet comprising a unique source address for validating the beacon packet.
3. The method of claim 1, said receiving further comprising:  
receiving the beacon packet from a neighboring network node other than the parent node; and  
deleting the beacon data packet received from the neighboring node when the network isolation condition is not indicated.
4. The method of claim 3, further comprising:  
transmitting a request to the neighboring network node to register the neighboring network node as a new parent node when the network isolation condition is indicated.
5. The method of claim 4, said transmitting further comprising:

transmitting a discovery message upstream; and  
receiving a reply to the discovery message from the neighboring network node on  
an upstream port.

6. The method of claim 4, further comprising:  
receiving an approval from the neighboring network node in response to the  
request;  
deleting a parent status of the parent node; and  
storing an indication of the neighboring network node as the new parent node.

7. The method of claim 1, wherein the second interval is at least twice the aging  
interval.

8. The method of claim 1, further comprising:  
continuously receiving a plurality of beacon packets that are individually  
transmitted by a root node at an interval that is shorter than the predetermined aging interval.

9. The method of claim 1, further comprising:  
transmitting the beacon data packet received from the parent network node to all  
neighboring network nodes.

10. The method of claim 1, further comprising:  
receiving a network reconfiguration command; and

selecting a new parent node that is not a descendant node within the network in response to the network reconfiguration command.

11. The method of claim 10, further comprising:  
operating in a discovery state after the indication of the network failure condition until the new parent node is identified.
12. The method of claim 1, said storing performed by a network switching element of a node without any processing by a central processing unit (CPU) of the node.
13. The method of claim 1, the network comprising an Ethernet protocol network.
14. The method of claim 1, the age indicator stored in an age field of a packet address table.
15. The method of claim 1, further comprising:  
storing an age indicator for a plurality of stored data packets other than the beacon packet at the predetermined aging interval.
16. A computer readable medium encoded with processing instructions for implementing a method for detecting a network isolation by a network node, the method comprising:  
receiving a beacon packet from a parent node over a network;

storing an aging indicator for the beacon packet after an aging interval; and  
indicating a network isolation condition if the beacon packet with the aging indicator is not replaced with a second beacon packet after a second interval greater than the aging interval.

17. An apparatus for detecting a network isolation by a network node, comprising:  
means for receiving a beacon packet from a parent node over a network;  
means for storing an aging indicator for the beacon packet after an aging interval;  
and  
means for indicating a network isolation condition if the beacon packet with the aging indicator is not replaced with a second beacon packet after a second interval greater than the aging interval.

18. A method for identifying a network connection failure, the method comprising:  
receiving a beacon packet from a parent node over a network, the beacon packet comprising a latest of a series of received beacon packets transmitted at a beacon interval by a root node;  
replacing a stored beacon packet with the received beacon packet;  
storing the received beacon packet until a receipt of a subsequent beacon packet;  
storing an age indicator for the received beacon packet after an aging interval that is greater than the beacon interval; and

determining a network failure based on the age indicator if the received beacon packet has not been replaced by the subsequent beacon packet after an outage interval that is greater than the aging interval.

19. The method of claim 18, the outage interval being at least twice the aging interval.
20. A method for establishing a self-healing tree network, comprising:
  - generating a beacon packet including a unique source address;
  - transmitting the beacon packet to a downstream node at an interval that is less than an aging interval used by the downstream node to age the beacon packet, whereby the age of the beacon packet may be used by the node to determine a network isolation.
21. A method for re-establishing a network connection, comprising:
  - determining a network isolation based on an age of a stored beacon packet received from a parent node;
  - searching for a new beacon packet from a neighboring node other than the parent node;
  - receiving the new beacon packet from the neighboring node; and
  - transmitting a registration request to the neighboring node to establish the neighboring node as a new parent node.
22. The method of claim 21, further comprising:

receiving an acknowledgement of the registration request from the neighboring node; and

establishing the neighboring node as a new parent node.

23. A method for accepting a child node comprising:

transmitting a beacon packet to a neighboring node;

receiving a registration request from a neighboring node to establish the neighboring node as a child node;

transmitting a discovery message on an upstream port to determine if the neighboring node is an ancestor node; and

transmitting an acknowledgement of the registration request if the discovery message is not later received from the neighboring node.

24. The method of claim 23, said transmitting an acknowledgement further comprising:

determining whether the neighboring node is an ancestor node based on a stored address of the neighboring node; and

transmitting the acknowledgement only when the stored address is not an ancestor address.